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The perceived benefits of six-degree-separation social networks

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Abstract

Purpose – This research seeks to focus on the benefits of social networking service (SNS) based on the principle of six degrees of separation. Since the inception of web 2.0, the popularity of social networks (SNS) has continued to increase. Some SNS are based on six degrees of separation (6SNS), and these have emerged as the most frequently visited WWW sites.

Design/methodology/approach – Using a randomized control group pre-test-post-test experimental design, responses to a questionnaire to test the differences among 6SNS users and non-users on 12 issues of benefit were analyzed.

Findings – The tests show, first, that, compared with traditional virtual communities, SNS evoke higher ratings for "trust in website," "trust in other members," and "quality of friends." Second, SNS can provide users with entertainment and greater social involvement. People who use these sites express positive attitudes about them. Third, no significant differences were found between SNS and traditional internet media on "meeting new friends," "maintaining relationships," "searching for friends," "searching for information," and "understanding and learning." These results can be attributed to language differences.

Originality/value – The value of 6SNS is recognized by the business world. In October 2007, Microsoft invested $240 million to buy 1.6 percent shares of Facebook. Today Facebook alone has more than 300 million users. In addition to the perspective from the business world, how the users themselves view 6SNS and what benefits they can get are crucial to its sustainability.

Keywords Social networks, Communication technologies, Experimental design

Paper type Research paper

1. Introduction

With the advent of web 2.0, new applications began to appear, such as wikis, social bookmarking, podcasting, blogs, really simple syndication (RSS), and software as a service (SAAS). The major difference between web 2.0 and web 1.0 is who creates the content; in web 2.0, it is created by the user. Our social life is also affected. Schools, workplaces, and public areas are communities. Web 2.0 gives people another option for connecting with others – the internet. This option encompasses virtual communities, BBS, online games, instant messengers, and so on. New services are also being integrated into online social networks (SNS) through such vehicles as blogging, photo and video sharing, e-mailing, forum discussions, map services, and so on. According to a report by Alexa, published on December 1, 2007, four SNS are among the ten most popular websites, as shown in Table I. If we add YouTube and Wikipedia, there are six user-generated content-oriented websites on the list.

SNS connect people with similar interests. They allow users to establish their profiles, list other users they know, and search for other users (Boyd and Ellison, 2007;

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Ranking	Website	Category
1	Yahoo!	Portal
2	YouTube	Video sharing
3	Windows Live	Search engine
4	Google	Search engine
5	Myspace	SNS
6	Facebook	SNS
7	MSN	Portal
8	Hi5	SNS
9	Wikipedia	Wiki
10	Orkut	SNS

Note: Alexa (2007)

Table I.
Top ten websites

Sundén, 2003). SNS not only provide platforms for online friendships, but they also enhance the relationships among offline friends. Haythornthwaite states that what makes SNS unique is not that they allow individuals to meet strangers, but rather that they enable users to articulate their social networks and make them visible (Haythornthwaite, 2005).

One type of SNS is of particular interest to us – the one built upon the principle of six degrees of separation (Milgram, 1967). Research has shown that any two strangers are, on average, distanced by 6.6 degrees of separation (Leskovec and Horvitz, 2008). We abbreviate this type of SNS as 6SNS. This means that a 6SNS user builds her social network from the ones close to her and then extends her network by bringing her friends' networks. This can be extended and by 6.6 hops on average, she can reach almost any strangers, according to the theory. The traditional SNS ignores this chain. A non-6SNS user builds her network by immediately connecting to the internet world. The first people on her friend list can but do not have to be her close friends.

We chose this emerging type of SNS for three reasons. First, six degrees of separation means that we can potentially extend our social network to the whole world with much fewer degrees of separation than one might imagine. Such an impact must be given attention.

Second, six degrees of separation implies building weak ties, which in turn encourage strong ties. In SNS with weak ties, people usually contact one another at least once a year. In SNS with strong ties, people are more closely interconnected (Granovetter, 1973; Hansen, 1999). Studies have shown that weak-tie SNS are more effective than strong-tie SNS for sharing information and enhancing social activities, such as job hunting (Ericksen and Yancey, 1980; Granovetter, 1973; Levin and Cross, 2004). The primary reason is that people with strong ties have too many overlaps. By using weak- tie SNS, people have a better chance to acquire and synthesize diverse pieces of information (Granovetter, 1973).

Third, the value of such SNS has been noticed by IT and marketing professionals. By grouping weak-tie networks, firms can achieve the fruits of consumer segmentation. By watching network trends, firms can achieve brand monitoring, which is hard to achieve with traditional marketing tools (Li and Bernoff, 2008). Table II briefly compares the two types of SNS – one based on six-degree of separation, the other not.

In this paper, we proposed 6SNS benefits perceived by users over traditional SNS. We also answer the question: Are there any differences in perspective between 6SNS users and non-users?

The paper proceeds as below. We first present literature review on social networks, followed by an extended review on six degrees of separation. The hypotheses of this study are presented in the next section. Research methodology, hypotheses and questionnaire construction, and procedure will be described in sections 4 and 5. They are followed by data analysis in section 6. The last two sections will be contributed to discussions, implications, conclusions of this study and future studies.

2. Literature review

2.1 Social networks

Social network is the term applied by social researchers to comprehend various inter-personal dynamics that take place within the immediate environment of people (Cohen and Syme, 1985; Fischer, 1982; Wellman, 1979). It reflects a wide range of relationships that people maintain with other people and can directly impact on the well-being of people (Berkman and Syme, 1979; Hammer, 1983; Thoits, 1982; Wills, 1985). In a social network, people can readily present themselves, and allow others to get acquainted with and connect them based on the data stored in their online profiles. This forms a social structure made of individuals or organizations called "nodes." The interdependency of nodes represents people's friendship, and other relationships.

Social networks have been discussed and some definitions have been proposed. J.A. Barnes introduced the term of social networks to denote patterns of ties including bounded groups (e.g. families, villages, and so on) and social categories (e.g. sex, race, and so on) (Barnes, 1954). Van der Poel proposed four different approaches to understand social networks (Van der Poel, 1993) which can also be regarded as the four fundamental features of social networks:

(1) *Interaction approach*. It is based on the contacts individuals have with others over a period time.

(2) *Role relation approach*. It focuses on the types of roles which impact on individuals, such as family members or intimate friends.

(3) *Affection approach*. It is individuals' subjective criteria to determine who is the most important to him/her.

(4) *Exchange approach*. It is individual behavior based on specific rewarding systems to determine the scope and composition of one's social network.

Category	Traditional	SNS
Mode of establishing relationships	Point-to-point	Six degrees of separation
Virtuality	More virtual	Extension of point-to-point contact
Searching for new friends	Difficult	Easier
Trust	Low	Higher
Anonymity	High	Low
Source of friends	Internet	Non-virtual world, or friends of friends
Examples	Match.com, Hi5, MySpace	Facebook

Table II.
Comparison of SNS and traditional websites

Van der Poel considered that the last approach is the most useful for delineating personal social networks. The scope of our study will be base on Van der Poel's classifications.

2.2 Six degrees of separation

Six degrees of separation is one type of SNS. Milgram proposed this influential concept in 1967 (Milgram, 1967). Milgram and his colleagues made a series of social experiments and suggested that people in the USA are connected by six links on average.

Milgram was not the first to propose this idea. Frigyes Karinthy, a Hungarian writer, conjectured that any two people on earth could be connected by five handshakes in his 1929 short story titled "Chains" (Karinthy, 1929). Pool and Kochen then designed a mathematical model to explain this phenomenon in the late 1950s and further hypothesized that no more than three or four degrees of separation would be needed to connect any two people in the world (Pool and Kochen, 1978). Inspired by these ideas, Milgram set out an experiment. He chose 300 participants and gave each one a letter aimed for another person. The two people were not known to be connected in any way. Then, each one passed his/her letter to another person, who was believed to know the target person, and passed it to another one and so on, until the letter was delivered to the designated recipient. No one knew the address of the target person.

Milgram concluded that only four intermediary people were required to deliver each letter; hence, the phenomenon is called six degree of separations. Milgram's work demonstrates that each person is only a few social steps away from another. He took this theory and with other studies to state that we really live in a small world (Milgram, 1967).

3. Hypotheses

From a literature review we identified 12 distinct factors associated with SNS use: meeting new friends, entertainment, maintaining relationships, understanding and learning, searching for friends, social involvement, trust in websites, trust in other members, information searching, costs, quality of friends, and attitudes. We decided to empirically study whether the use of 6SNS yields different outcomes on these dimensions.

3.1 Meeting new friends

Some studies show that people use SNS as a new channel to meet people outside their non-virtual environment. Such relationships are built upon common interests rather than physical location (Lampe *et al.*, 2006; Wellman, 1996). Other studies show that the purpose of meeting new friends online is to obtain emotional support not available offline, and such people eventually meet face-to-face (Ellison *et al.*, 2006; McKenna and Green, 2002; Parks and Floyd, 1996; Wellman *et al.*, 2001).

3.2 Entertainment

Many people use the internet to be entertained and relax (activity outcomes) and to kill time (self-reactive outcomes) (Flanging, 2005; Larose and Eastin, 2004; Papacharissi and Rubin, 2000).

3.3 Maintaining relationships

Losing contact with old friends means reducing social capital (Paul and Brier, 2001; Putnam, 2000). People now use internet tools to keep existing friendships, especially

with distant friends (Cummings *et al.*, 2002; Ellison *et al.*, 2007; Wellman *et al.*, 2001). People started using SNS to maintain relationships. For them, organizing their SNS profiles is equivalent to managing their friendships (Donath and Boyd, 2004; Ellison *et al.*, 2007).

3.4 Understanding and learning

SNS provide personal profiles and make it easier to make friends. Haspels points out that some SNS offer news feeds, photo updates, and so on, so that people can get acquainted with one another without engaging in conversation (Haspels, 2008). Sproull points out that SNS make it easier to interact with people and create new groups (Sproull and Faraj, 1995).

3.5 Searching for friends

Two types of friend searching have been identified: social searching and social browsing (Lampe *et al.*, 2006). Social searching means searching for close friends online and getting to know them better. Social browsing means searching for people whom one just wants to get acquainted with and perhaps become friends with offline.

3.6 Social involvement

The question of whether the internet increases social capital is still being debated. Putnam divides social capital into network capital (relationships with friends and neighbors) and participatory capital (involvement in politics and volunteer organizations) (Putnam, 2000). Kraut and Nie (Kraut *et al.*, 1998; Nie and Erbing, 2000) believe that the use of the internet reduces social capital, but Wellman takes the opposite position (Wellman *et al.*, 2001).

3.7 Trust in websites

The trustworthiness of websites has been challenged. For example, Hass and Chiaramonte show that the media discredit SNS (Chiaramonte and Martinez, 2006). Dwyer notes that many SNS do not have a privacy policy (Dwyer, 2007). Lessig points out that online social activities cannot be traced (Lessig, 1998). Dwyer believes that trust is important; he shows that people are more willing to share information on Facebook than on Myspace, due to greater trust in Facebook (Dwyer, 2007).

3.8 Trust in other members

Mutual trust is the key determinant of new relationships and information sharing (Fukuyama, 1996; Homans, 1958; Lewis and Weigert, 1985; Pereira and Soares, 2007). It is also important for online interactions (Coppola *et al.*, 2004; Jarvenpaa and Leidner, 1998; Yang and Farn, 2009). Gross and Acquisti identify two risks associated with SNS: online risks and offline risks (Gross and Acquisti, 2005). Lenhart and Madden point out that 46 percent of online profiles contain wrong information, which leads to risk and distrust (Lenhart and Madden, 2007).

3.9 Information searching

Granovetter divides social ties into strong ties and weak ties:

> Strong ties between people arise from long-term, frequent, and sustained interactions; weak ties from infrequent and more casual ones (Granovetter, 1973).

He points out that:

> The "problem" with strong ties is that if persons A and B have a strong tie, they're also likely to be strongly tied to all members of each other's networks. In other words, there's likely to be a lot of overlap in their friendship circles. This might be a good thing in many ways, but it's bad news if A needs a piece of knowledge that she can't find inside her own friendship circle. Because of the overlap, B's circle is likely to be redundant with A's, and so unhelpful to her. In other words, her tie to B does her little good in her search for knowledge. If A and C have a weak tie, however, many of C's friends are likely to be strangers to A, and so are good resources as she looks to inform herself.

Thus, building weak ties reduces social costs, extends the pool of information searching, and enhances trust among people (Hansen *et al.*, 2005; Levin and Cross, 2004). Thus, online SNS can be a tool for building multiple weak ties (McAfee, 2007).

3.10 Costs

According to Cassidy, online users on average spend 20 minutes a day on SNS, and two thirds of them log on at least once a day (Cassidy, 2006). They may use e-mail or listservers instead of SNS or multi-user dungeon (MUD), because the former are easier and take less time (Cummings *et al.*, 2002).

3.11 Quality of friends

Some studies have reported that the quality of online social interactions and relationships is lower than that of face-to-face ones (Bargh *et al.*, 2002; Cummings *et al.*, 2002; Haythornthwaite, 2005; Mesch and Talmud, 2006). These studies were done before the spawning of 6SNS, and their online settings are traditional tools such as email and messaging. As the purpose of 6SNS is to better understand people with whom one has both strong and weak ties, will 6SNS prove to be of better quality?

3.12 Attitudes

The theory of reasoned action and the technology acceptance model are frequently used to predict the relationship between attitudes and behavior (Davis, 1989; Fishbein and Ajzen, 1975). Attitude is defined as a hypothetical construct representing an individual's degree of like or dislike for an item.

Based on these 12 dimensions, we constructed the pre-test questionnaire displayed in Table III.

4. Research methodology and hypotheses

Following Campbell and Stanley, we used a randomized control group pre-test-post-test design to analyze the above 12 dimensions (Campbell and Stanley, 1963). Because we wanted to see if using a 6SNS causes differences, an experimental design is appropriate. The purpose of comparing experimental and control groups is to determine if using or not using a 6SNS would cause between-group differences on the 12 dimensions described above. The purpose of the pre-test-post-test comparison was to determine if using a 6SNS would produce changes on the 12 dimensions.

The sample consisted of freshmen at a major Taiwanese university. Most had no prior SNS experience at the time of testing. Those with odd student ID numbers ($n = 61$) were assigned to the experimental group and those with even numbered IDs ($n = 62$) were assigned to the control group. Four tests were conducted, as shown in Table IV.

Dimension	Code	Item
Meeting new friends	A1	SNS can help me make more friends
	A2	SNS can help me maintain online friendships
	A3	SNS can help me find friends sharing the same interests as mine
	A4	SNS can help me share my thoughts online
	A5	SNS can help me assist my internet friends
	A6	SNS are a good way to make friends
	A7	SNS are a good way to find friends with the same interests as mine
	A8	I will use SNS to make new friends
Entertainment	B9	SNS are interesting websites
	B10	SNS can entertain me
	B11	I use SNS to kill time
	B12	SNS make me happy
	B13	SNS can bring me out of a depression
Maintaining relationships	C14	SNS can help me contact old friends
	C15	SNS can help me contact distant friends
	C16	SNS can help me contact friends whom I usually do not have time to contact
	C17	SNS can help me stay connected with old friends
	C18	SNS can help me stay connected with distant friends
	C19	SNS can help me stay connected with friends whom I usually do not have time to contact
Understanding and learning	D20	SNS can help me understand my friends more
	D21	SNS can help me learn how to get along with people
	D22	SNS can help my social learning
	D23	SNS can help me interact with people
	D24	I learn a lot from SNS
	D25	I believe SNS are a platform for social learning
	D26	I believe SNS are a platform for social interaction
	D27	I feel SNS are a microcosm of society
Searching for friends	E28	SNS can help me find friends to meet
	E29	SNS can help me find classmates or colleagues
	E30	SNS can help me find lost friends
	E31	SNS can help me find more information about my offline friends
	E32	In general, SNS help me make friends
	E33	SNS are a good tool for finding old friends
	E34	SNS are a good tool for finding people
Social involvement	F35	SNS can help me improve my interpersonal relationships
	F36	SNS are good for mental health
	F37	SNS can help me participate in more social activities
	F38	SNS can help me get along with people more easily in real life
	F39	SNS can help me avoid being isolated
	F40	SNS can help me escape loneliness
	F41	SNS can help me increase my social involvement
	F42	SNS can help me know more people in real life

Table III.
Pre-test questionnaire

(*continued*)

Dimension	Code	Item
Trust in websites	G43	I trust SNS in general
	G44	I believe SNS do not use my information for other purposes
	G45	I believe SNS are trustworthy
	G46	I believe SNS respect my privacy
	G47	I believe in SNS privacy policies
	G48	I believe SNS do not give my information to other people
Trust in other members	H49	I believe my SNS friends are sincere
	H50	I believe my SNS friends are trustworthy
	H51	I believe my SNS friends do not use my information for other purposes
	H52	I believe my SNS friends are dependable
	H53	I believe my SNS friends are harmless
	H54	I believe my SNS friends do not cheat me
Information searching	I55	SNS can help me find school-related information
	I56	SNS can help me find work-related information
	I57	My SNS friends provide me with information
	I58	SNS make it easier for me to get information
	I59	SNS can help me find interesting and unique information
Cost	J60	SNS are time-consuming
	J61	People are too busy to use SNS
	J62	Using SNS is costly
	J63	Using SNS is tedious
	J64	Using SNS is a waste of time
Quality of friends	K65	It is meaningful to have SNS friends
	K66	SNS friends are quality people
	K67	SNS friends are interesting
	K68	SNS friends are valuable
	K69	SNS friends are amiable
	K70	SNS friends are good people
Attitudes	L71	Using SNS is a good idea
	L72	Using SNS is enjoyable
	L73	SNS are a trend
	L74	It is wise to use SNS
	L75	I feel happy using SNS

Table III.

Group		Pre-test	Experiment	Post-test
Experimental	$n = 61$	T1	X	T2
Control	$n = 62$	T3		T4

Table IV.
Experiment design

Within-group hypotheses:

H1a. People rate themselves higher on "meeting new friends" after using a 6SNS than before.

H1b. People rate themselves higher on "entertainment" after using a 6SNS than before.

H1c. People rate themselves higher on "maintaining relationships" after using a 6SNS than before.

H1d. People rate themselves higher on "understanding and learning" after using a 6SNS than before.

H1e. People rate themselves higher on "searching for friends" after using a 6SNS than before.

H1f. People rate themselves higher on "social involvement" after using a 6SNS than before.

H1g. People rate themselves higher on "trust in websites" after using a 6SNS than before.

H1h. People rate themselves higher on "trust in other members" after using a 6SNS than before.

H1i. People rate themselves higher on "information searching" after using a 6SNS than before.

H1j. People rate themselves lower on "costs" after using a 6SNS than before.

H1k. People rate themselves higher on "quality of friends" after using a 6SNS than before.

H1l. People rate themselves more positively on "attitudes" after using a 6SNS than before.

4.2 Between-group hypotheses

H2a. 6SNS users rate themselves higher than non-users on "meeting new friends."

H2b. 6SNS users rate themselves higher than non-users on "entertainment."

H2c. 6SNS users rate themselves higher than non-users on "maintaining relationships."

H2d. 6SNS users rate themselves higher than non-users on "understanding and learning."

H2e. 6SNS users rate themselves higher than non-users on "searching for friends."

H2f. 6SNS users rate themselves higher than non-users on "social involvement."

H2g. 6SNS users rate themselves higher than non-users on "trust in websites."

H2h 6SNS users rate themselves higher than non-users on "trust in other members."

H2i. 6SNS users rate themselves higher than non-users on "information searching."

H2j. 6SNS users rate themselves lower than non-users on "costs."

H2k. 6SNS users rate themselves higher than non-users on "quality of friends."

H2l. 6SNS users rate themselves more positively than non-users on "attitudes."

5. Questionnaire construction and procedure

5.1 First stage: pre-test

5.1.1 Questionnaire content and distribution. The pre-test questionnaire is presented in Table III. There are three sections – demographic data, SNS behavior (how often one uses an SNS, etc.), and SNS perceptions – comprising the 12 dimensions. The order of the 70 questions was randomized. Responses were made on seven-point Likert-type scales, with 7 = "strongly agree."

Two types of questionnaire were used. Type A was for 6SNS users and type B for non-users. They are essentially the same (see Table V). A total of 37 questionnaires were distributed to the respondents. As they were filled out in class, all 37 were collected. Two questionnaires were invalid, so 35 were used for the validity and reliability tests.

5.1.2 Validity and reliability tests. We depended on the literature review in section 2 and 3 to develop a scale with good content validity and face validity. Some items were taken directly from the literature, and some were our own but based on those in the literature. The preliminary questionnaire was sent to six scholars with domain knowledge and extensive experience on the internet. An MIS professor checked the internal validity of the questions, and two PhD candidates helped them evaluate the questionnaire further. Three professionals were invited to check for whether the questions are really important for knowledge sharing on the internet. All six judges agreed that the questionnaire "can measure what it is supposed to measure" and that "all dimensions are essential to the evaluation of knowledge sharing in virtual communities." Thus, face validity and content validity were achieved.

Reliability was tested by computing Cronbach's α. Guilford suggested that an α value greater than 0.7 means that the reliability is adequate (Guilford, 1965). If α for a version of the scale was less than 0.7, we eliminated one or more items to improve reliability. The α values before and after item reduction are listed in Table VI.

We also examined factor loadings to determine construct validity and for data reduction. The presence of items with low factor loadings indicates that the items cannot converge at a common point on the same dimension. Such items were eliminated from the questionnaire. As a general rule, a standardized loading of 0.71 (0.5 squared) was selected as the cut-off point, because it means that 50 percent of the item variance is explained by the latent factor.

We began by performing the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test for sphericity to determine if the scales were adequately factorable (Kaiser, 1974). A KMO score greater than 0.8 means that the items have small partial correlations; in fact, all the KMO scores were higher than 0.8. Bartlett's test was significant ($p < 0.05$) for all scales, showing that the correlation matrices of items are not identity matrices. These two results combined confirm that the scales are factorable.

We next did a factor analysis to obtain factor loadings. In the column "items deleted" in Table VI, we identify the items with loadings lower than 0.71. After deleting these items, we recalculated Cronbach's α and found all values to be greater than 0.7.

Questionnaire A (6SNS users)	Questionnaire B (non-6SNS users)
SNS friends are quality people	Internet friends are quality people
Using SNS is a good idea	Using SNS might be a good idea
SNS can help me find lost friends	The internet can help me find lost friends
SNS can help me make more friends	The internet can help me make more friends

Table V.
Sample items from questionnaires A and B

Dimension	Item codes	Cronbach's α before deletion	Items deleted	Cronbach's α after deletion
Meeting new friends	A1-A8	0.828	A5, A7, A8	0.845
Entertainment	B9-B13	0.838	B12	0.844
Maintaining relationships	C14-C19	0.897	C14, C18, C19	0.909
Understanding and learning	D20-D27	0.841	D23-D27	0.905
Searching for friends	E28-E34	0.876	E28, E34	0.883
Social involvement	F35-F42	0.824	F35-F37, F39, F22	0.812
Trust in websites	G43-G48	0.856	G43, G44	0.885
Trust in other members	H49-H54	0.914	H49 H51	0.937
Information searching	I55-I59	0.868	I57, I59	0.9
Costs	J60-J64	0.676	All questions	N/A
Quality of friends	K65-K70	0.876	K65, K69	0.899
Attitudes	L70-L75	0.853	L73	0.863

Table VI.
Reliability comparison of the scales

5.2 Experimental design and pre-tests

5.2.1 Sample description. The questionnaire described in section 5.1 was used for the pre-tests (T1 and T3 in Table IV). The samples consisted of 123 students taking the course "Introduction to MIS" at National Central University, Taiwan. The tests were given on 31 March 2008. The experimental group used Facebook for two months after the pre-test, while the control group did not. We chose Facebook because it is one of the most popular SNS sites, and the most popular using six degrees of separation. According to official statistics, there are more than 500 million registered users in Facebook and the number continues growing (CheckFacebook.com, 2010).

We received 102 questionnaires back for the pre-test (a response rate of 83 percent); 92 of the questionnaires were valid (see Table VII).

5.2.2 Validity tests. We focused on construct validity at this stage. A factor analysis was conducted to test convergent and discriminant validity using the average variance extracted (AVE) method (Fornell and Larcker, 1981). Table VIII shows that the AVE for each dimension is greater than 0.5, demonstrating the questionnaire's convergent validity. It also shows that the square root of the AVE estimates for any two factors are greater than the correlation between the two factors, thereby demonstrating discriminant validity (Segars, 1996).

5.2.3 Reliability tests. We used both composite reliability (CR) and Cronbach's α to test for reliability (Segars, 1996). The cut-off point for both criteria is 0.7. Table IX

	Group	Questionnaire distributed	Questionnaire returned	Response rate (%)	Invalid samples	Valid samples
Pre-test	Experimental	61	53	86	6	47
	Control	62	49	79	4	45
	Total	123	102	83	10	92
Post-test	Experimental	61	61	100	14	47
	Control	62	60	96	22	38
	Total	123	121	98	26	95

Table VII.
Response rates and valid questionnaires

	A	B	C	D	E	F	G	H	I	K	L
A	(0.70)										
B	0.52	(0.82)									
C	0.36	0.25	(0.85)								
D	0.43	0.49	0.18	(0.79)							
E	0.44	0.20	0.50	0.13	(0.80)						
F	0.41	0.29	0.19	0.55	0.14	(0.76)					
G	0.24	0.09	0.04	0.45	0.10	0.29	(0.86)				
H	0.25	0.19	0.07	0.14	0.06	0.21	0.36	0.88)			
I	0.27	0.24	0.46	0.13	0.48	−0.03	0.09	−0.06	(0.86)		
K	0.62	0.45	0.28	0.41	0.42	0.37	0.43	0.60	0.21	(0.81)	
L	0.54	0.62	0.30	0.49	0.32	0.41	0.39	0.45	0.17	0.64	(0.83)

Note: Numbers in parentheses are the square root of the AVE

Table VIII.
Variance extracted

Dimension	CR	Cronbach's α
A	0.83	0.74
B	0.89	0.83
C	0.88	0.80
D	0.83	0.69
E	0.90	0.86
F	0.80	0.60
G	0.92	0.88
H	0.93	0.90
I	0.89	0.82
K	0.88	0.81
L	0.90	0.85

Table IX.
Reliability statistics

shows CR and α for each dimension. We found that all CR values and alphas are acceptable, except the alpha for F, social involvement.

5.3 Post-test

After the participants in the experimental group used the SNS for one month, we gave the post-test questionnaire. Table VIII shows the responses, eliminating those that are invalid. The main reason for the initial lack of validity is prior use of an SNS by control group members, which was addressed by question 7, "When you used an SNS?" The other main reason involved the corresponding item for experimental group members (question 6), "How often do you use an SNS per week?"

6. Data analysis

We conducted three types of data analysis:

(1) Pre-test comparisons of the experimental and control groups for homogeneity of variance.

(2) Pre-test-post-test comparisons of experimental group members on the effects of using SNS.

(3) Post-test comparisons of the experimental and control groups on the effects of using SNS.

6.1 Pre-test comparisons of the experimental and control groups

One-way ANOVA were conducted for these tests. As shown in Table X, the two groups are essentially the same on all 12 dimensions.

6.2 Pre-test-post-test comparisons of the experimental group

A MANOVA was used for this test. The resulting F value of 5.847 (Wilks' $\lambda = 0.589$) is significant ($p < 0.001$). This result indicates that the users perceived benefits from using SNS. We then used t tests to test the SNS effect on individual dimensions (Hypotheses *H1a-H1l*). The results are listed in Table XI. The results of the MANOVA and t tests show that SNS are perceived as having a wide range of benefits. Among these 12 dimensions, "meeting new friends," "understanding and learning," "trust in websites," "trust in other members," quality of friends," and "attitudes" show significant changes after using a 6SNS. We discuss these findings further in section 7.

6.3 Post-test comparisons of the experimental and control groups

Again using a MANOVA, we obtained an F value 2.882 (Wilks' $\lambda = 0.724$), which is significant ($p = 0.003$). This result demonstrates that 6SNS users perceived more benefits from the website they used than did non-6SNS users. We then used t tests to evaluate the 6SNS effects on the individual dimensions (Hypotheses *H2a-H2l*). The results are listed in Table XII.

Dimension	Group	Average	SD	F value	p-value
A	Control	5.07	0.60	0.467	0.496
	Experimental	4.97	0.75		
B	Control	5.20	0.87	3.217	0.076
	Experimental	4.90	0.68		
C	Control	5.86	0.83	0.368	0.546
	Experimental	5.95	0.70		
D	Control	4.47	0.82	0.332	0.566
	Experimental	4.36	0.92		
E	Control	5.31	0.76	0.973	0.327
	Experimental	5.14	0.81		
F	Control	4.55	0.68	2.279	0.135
	Experimental	4.29	0.93		
G	Control	0.18	0.74	1.692	0.197
	Experimental	3.93	1.01		
H	Control	3.78	0.64	0.862	0.356
	Experimental	3.94	0.90		
I	Control	5.52	0.79	0.065	0.796
	Experimental	5.48	0.84		
K	Control	4.33	0.50	0.162	0.688
	Experimental	4.39	0.87		
L	Control	4.68	0.61	0.026	0.872
	Experimental	4.70	0.80		

Note: Criterion for significance is $p < 0.05$ two-tailed

Table X.
ANOVA comparing the experimental and control groups

Dimension	Test	Mean	SD	*T*-value	*p*-value
H1A	Pre-test	4.97	0.75	1.377	0.085
	Post-test	5.18	0.81		
H1B	Pre-test	4.90	0.68	1.837	0.034
	Post-test	5.19	0.86		
H1C	Pre-test	5.95	0.70	−3.273	0.001
	Post-test	5.39	0.99		
H1D	Pre-test	4.36	0.92	1.804	0.037
	Post-test	4.70	1.01		
H1E	Pre-test	5.14	0.81	−0.403	0.344
	Post-test	5.08	0.90		
H1F	Pre-test	4.29	0.93	1.179	0.121
	Post-test	4.50	0.94		
H1G	Pre-test	3.93	1.01	3.118	0.001
	Post-test	4.55	0.98		
H1H	Pre-test	3.94	0.90	2.807	0.003
	Post-test	4.42	0.83		
H1I	Pre-test	5.48	0.84	−4.208	0.000
	Post-test	4.81	0.77		
H1K	Pre-test	4.39	0.87	2.834	0.003
	Post-test	4.83	0.69		
H1L	Pre-test	4.70	0.80	2.481	0.007
	Post-test	5.11	0.84		

Note: Criterion for significance is $p < 0.10$, one tailed ($t_{\alpha=0.1} > 1.29$)

Table XI.
Pre-test-post-test comparison for experiment group

Table XII shows that the experimental group obtained significantly higher scores than the control group on "understanding and learning," "trust in websites," "trust in other members," and "quality of friends." We discuss these results in section 7.

7. Discussion and implications

The results show that:

(1) After using a 6SNS, users clearly perceive their benefits.

(2) 6SNS users significantly perceive more benefits from the websites they have used than do non-6SNS users.

(3) Among the dimensions we tested, the following hypotheses are supported:

H1a. After using a 6SNS, people perceive a benefit in terms of "meeting new friends."

H1b. After using a 6SNS, people perceive a benefit in terms of "entertainment."

H1d. After using a 6SNS, people perceive a benefit in terms of "understanding and learning."

H1g. After using a 6SNS, people perceive a benefit in terms of "trust in websites."

H1h. After using a 6SNS, people perceive a benefit in terms of "trust in other members."

Dimension	Group	Average	SD	*T*-value	*p*-value
H2A	Control	5.18	0.72	0.802	0.212
	Experimental	5.18	0.80		
H2B	Control	4.87	0.81	1.103	0.136
	Experimental	5.19	0.86		
H2C	Control	5.16	1.20	0.957	0.171
	Experimental	5.39	0.99		
H2D	Control	4.44	1.02	1.600	0.056
	Experimental	4.70	1.01		
H2E	Control	4.70	0.99	0.996	0.161
	Experimental	5.08	0.89		
H2F	Control	4.01	0.80	1.263	0.105
	Experimental	4.50	0.94		
H2G	Control	3.91	0.78	2.803	0.003
	Experimental	4.54	0.98		
H2H	Control	3.75	0.91	3.135	0.001
	Experimental	4.42	0.83		
H2I	Control	4.75	0.72	−0.166	0.434
	Experimental	4.81	0.77		
H2K	Control	4.45	0.76	2.883	0.003
	Experimental	4.82	0.69		
H2L	Control	4.95	0.70	0.631	0.265
	Experimental	5.10	0.83		

Note: Criterion for significance is $p < 0.10$, one tailed ($t_{\alpha=0.1} > 1.29$)

Table XII.
Post-test comparisons of the experimental and control groups

H1k. After using a 6SNS, people perceive a benefit in terms of "quality of friends."

H1l. After using a 6SNS, people perceive a benefit in terms of "attitudes."

H2d. 6SNS users perceive greater "understanding and learning" than do non-6SNS users.

H2g. 6SNS users perceive greater "trust in websites" than do non-6SNS users.

H2h. 6SNS users perceive greater "trust in other members" than do non-6SNS users.

H2k. 6SNS users perceive greater "quality of friends" than do non-6SNS users.

7.1 Hypotheses fully supported: week-tie effect

Among the supported hypotheses, "understanding and learning," "trust in websites," "trust in other members," and "quality of friends" are supported by both pre-test-post-test and experimental-control comparisons. These findings echo those of Dwyer (2007). Weak ties may have the greatest influence on the higher scores for "understanding and learning" among the 6SNS respondents. We probably know people who have strong ties with us well, and thus we will not learn much new from them in an online setting. For people with weak ties, the online setting may create an opportunity to learn more about one another. Thus, both *H1d* and *H2d* about "understanding and learning" are supported.

Compared with traditional SNS, 6SNS are an extension of offline social networks. As 6SNS friends are already connected to us to some degree, we can make better

judgments about whether or not their opinions are valuable, and whether (because of their relevance) they can provide us with high-value input generally. Thus, *H1G, H2G, H1H* and *H2H* about "trust in websites" and "trust in other members" are supported.

6SNS provide a filter that helps us choose who can and cannot be on our networks. Thus, it is reasonable that we have higher opinions of our 6SNS friends. For the same reason, we have less concern about fake profiles of other people, as well as cheating and plagiarism (Gross and Acquisti, 2005; Lenhart and Madden, 2007). Thus, *H1k* and *H2k* about "quality of friends" are supported.

7.2 Hypotheses partially supported

"Meeting new friends", "entertainment," and "attitudes" are the dimensions significantly supported by the pre-test-post-test comparisons. The scores of the 6SNS users are higher than those of the non-6SNS users, although not significantly so.

The higher mean on "entertainment" can be attributed to the 6SNS platform we chose to use. Facebook is famous for its applets and MySpace is considered a window for teen culture. These sites can probably catch a user's eye before they actually go into business.

Users of the experimental groups also found 6SNS help them better meet new friends than traditional SNS, and preferred these sites ("attitude"). This tells us 6SNS do have better social networking effects than traditional ones once users are exposed to both types. However, the users of the control groups seem to be happy with traditional SNS when they are not aware of 6SNS. These "partially-supported" results are insightful, although not as strong as full support: when we review the history of social network site development, traditional SNS such as MySpace grew rapidly but they started to slow down when 6SNS came out (Owyang, 2008). Thus, for 6SNS developers, one important aspect they need to pay attention to is to make 6SNS more visible to the internet. In fact, they have done that in Taiwan. Before Facebook had Chinese version, its usage was quite limited in Taiwan, but after the Chinese interface developed which makes it visible to Taiwanese internet users, it experienced tremendous growth (Wikipedia, 2010).

7.3 Hypotheses not significantly supported

Although not significant, most tests of the other hypotheses also show better results for 6SNS users. One intriguing exception is "information searching." Although the result for this dimension is significant in the pre-test-post-test comparison, the pre-test score is higher. The pre-test score is also higher for the control group, but not significantly so. These results are opposite to those of Granovetter, who found that 83 percent of jobs were obtained with the help of people with weak ties, not strong ties (Granovetter, 1973), implying that weak ties are good sources of information. Our results also contradict the conclusion of McAfee (2007).

To understand this mismatch, we may need to make a distinction between information search and information referral. According to the Merriam-Webster dictionary, to "search" is to "look into or over carefully or thoroughly in an effort to find or to discover something." "Refer" is "to think of, regard, or classify within a general category or group." From these definitions, we can see that one involves networks and the other does not. When we look at searching, we see that the advantages of social networks do not apply, because 6SNS are not search engines. Thus, comparing their information searching capacity with that of commercial search engines may lead to unfavorable results for 6SNS.

Information referral is a different story. Referral is based on social ties, and thus one can expect social ties to improve information referral capacities, as has been shown by Granovetter (1973). However, building and extending social ties require time. As 6SNS has just gotten started, its referral capabilities may need time to become established.

8. Conclusions and future studies

Compared with traditional websites, social network sites are still in their infancy. In addition to the problem of limited selection, the business models these sites are developing tend to show stark differences. 6SNS sites (which are based on six degrees of separation and represent a subclass of SNS), have even less available selection than the others, but their business models are no less complicated. Because the present study was business-oriented, we selected 6SNS sites with potential usefulness for business, but not all 6SNS sites have this feature.

We also need to consider ethical issues when choosing a 6SNS site. According to Pierce's profile analysis of MySpace (Pierce, 2007), 59 percent of their pictures depict sexual positions, and 54 percent include profanity. This led us to exclude MySpace from our study. In addition, different countries have different 6SNS with a variety of different attributes. In our study, we considered only English-language websites because that is the only Western language we know. Had we known other languages, we could have compared the features of 6SNS in different cultural settings.

For these reasons, we hope to continue this research when 6SNS become more popular and there are more of them, thus allowing for greater generalizability.

References

Alexa (2007), "Alexa global top 500", available at: www.alexa.com/topsites

Bargh, J.A., McKenna, K.Y.A. and Fitzsimons, G.M. (2002), "Can you see the real me? Activation and expression of the true self on the internet", *Journal of Social Issues*, Vol. 58 No. 1, pp. 33-48.

Barnes, J.A. (1954), "Class and committees in a Norwegian island parish", *Human Relation*, Vol. 7, pp. 39-58.

Berkman, L. and Syme, S.L. (1979), "Social networks, host resistance and mortality: a nine-year follow-up study of Alameda County residents", *American Journal of Epidemiology*, Vol. 109, pp. 186-204.

Boyd, D.M. and Ellison, N.B. (2007), "Social network sites: definition, history, and scholarship", *Journal of Computer Mediated Communication*, Vol. 13 No. 1, pp. 210-30.

Campbell, D.T. and Stanley, J.C. (1963), *Experimental and Quasi-experimental Designs for Research*, Houghton Mifflin Company, Boston, MA.

Cassidy, J. (2006), "ME media", *The New Yorker*, pp. 50-9.

CheckFacebook.com (2010), available at: www.checkfacebook.com

Chiaramonte, P. and Martinez, E. (2006), "Jerks in space", *The New York Post*.

Cohen, S. and Syme, S.L. (1985), *Social Support and Health*, Academic Press, New York, NY.

Coppola, N., Hiltz, S.R. and Rotter, N. (2004), "Building trust in virtual teams", *IEEE Transactions on Professional Communication*, Vol. 47 No. 2, pp. 95-104.

Cummings, J., Butler, B. and Kraut, R. (2002), "The quality of online social relationships", *Communication of the ACM*, Vol. 45 No. 7, pp. 103-8.

Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-35.

Donath, J. and Boyd, D. (2004), "Public displays of connection", *BT Technology Journal*, Vol. 22 No. 4, pp. 71-82.

Dwyer, C. (2007), "Digital relationships in the 'MySpace' generation: results from a qualitative study", *Proceedings of the 40th Hawaii International Conference on System Sciences (HICSS), Hawaii*.

Ellison, N., Heino, R. and Gibbs, J. (2006), "Managing impressions online: self-presentation processes in the online dating environment", *Journal of Computer-Mediated Communication*, Vol. 11 No. 2, pp. 415-41.

Ellison, N., Steinfield, C. and Lampe, C. (2007), "The benefits of Facebook 'friends': exploring the relationship between college students' use of online social networks and social capital", *Journal of Computer Mediated Communication*, Vol. 12 No. 4.

Ericksen, E. and Yancey, V. (1980), "Class, sector and income determination", unpublished manuscript, Temple University, Philadelphia, PA.

Fischer, C.S. (1982), *To Dwell among Friends: Personal Networks in Town and City*, Chicago University Press, Chicago, IL.

Fishbein, M. and Ajzen, I. (1975), *Beliefs, Attitude, Intention and Behavior: An Introduction to Theory and Research*, Addison-Wesley Publishing, Boston, MA.

Flanging, A.J. (2005), "IM online: instant messaging use among college students", *Communication Research Reports*, Vol. 22 No. 3, pp. 175-87.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18, pp. 39-50.

Fukuyama, F. (1996), *Trust: The Social Virtues and the Creation of Prosperity*, Simon & Schuster, New York, NY.

Granovetter, M. (1973), "The strength of weak ties", *The American Journal of Sociology*, Vol. 78 No. 6, pp. 1360-80.

Gross, R. and Acquisti, A. (2005), "Information revelation and privacy in online social networks", Workshop on Privacy in the Electronic Society, Alexandria, VA.

Guilford, J.P. (1965), *Fundamental Statistics in Psychology and Education*, 4th ed., McGraw-Hill, New York, NY.

Hammer, M. (1983), "Core and extended social networks in relation to health and illness", *Social Science and Medicine*, Vol. 17, pp. 405-11.

Hansen, M.T. (1999), "The search-transfer problem: the role of weak ties in sharing knowledge across organization subunits", *Administrative Science Quarterly*, Vol. 44 No. 1, pp. 82-111.

Hansen, M.T., Mors, M.L. and Løvås, B. (2005), "Knowledge sharing in organizations: multiple networks, multiple phases", *The Academy of Management Journal*, Vol. 48 No. 5, pp. 776-93.

Haspels, M. (2008), "Will you be my Facebook friend?", *Proceedings of the 4th Annual GRASP Symposium, Wichita State University, Wichita, KS*.

Haythornthwaite, C. (2005), "Social networks and internet connectivity effects", *Information, Communication and Society*, Vol. 8 No. 2, pp. 125-47.

Homans, G.C. (1958), "Social behavior as exchange", *The American Journal of Sociology*, Vol. 63 No. 6, pp. 597-606.

Jarvenpaa, S. and Leidner, D. (1998), "Communication and trust in global virtual teams", *Journal of Computer-Mediated Communication*, Vol. 3 No. 4.

Kaiser, H.F. (1974), "An index of factorial simplicity", *Psychometrika*, Vol. 39, pp. 31-6.

Karinthy, F. (1929), *Everything Is Different*, Atheneum Press, Budapest, Chains.

Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukopadhyay, W. and Sherlis, W. (1998), "Internet paradox: a social technology that reduces social involvement and psychological well-being", *American Psychologist*, Vol. 53 No. 9, pp. 1017-31.

Lampe, C., Ellison, N. and Steinfield, C. (2006), "A face (book) in the crowd: social searching vs social browsing", *Proceedings of the 2006 20th Anniversary Conference on Computer Supported Cooperative Work, Canada*, pp. 167-70.

Larose, R. and Eastin, M. (2004), "A social cognitive theory of internet uses and gratifications: toward a new model of media attendance", *Journal of Broadcasting and Electronic Media*, Vol. 48 No. 3, pp. 358-77.

Lenhart, A. and Madden, M. (2007), "Teens, privacy, and online social networks", Pew Internet and American Life Project Report.

Leskovec, J. and Horvitz, E. (2008), "Planetary-scale views on a large instant-messaging network", *Proceedings of the 17th International Conference on World Wide Web, Beijing, China*, pp. 915-24.

Lessig, L. (1998), "The architecture of privacy", *Proceedings of the Taiwan NET '98 Conference*, Taipei, Taiwan.

Levin, D.Z. and Cross, R. (2004), "The strength of weak ties you can trust: the mediating role of trust in effective knowledge transfer", *Management Science*, Vol. 50 No. 11, pp. 1477-90.

Lewis, J.D. and Weigert, A. (1985), "Trust as a social reality", *Social Forces*, Vol. 63 No. 4, pp. 967-85.

Li, C. and Bernoff, J. (2008), *Groundswell*, Harvard Business Press, Cambridge, MA.

McAfee, A. (2007), "The impact of information technology (IT) on businesses and their leaders".

McKenna, K.Y.A. and Green, A.S. (2002), "Virtual group dynamics", *Group Dynamics: Theory, Research, and Practice*, Vol. 6 No. 1, pp. 116-27.

Mesch, G. and Talmud, I. (2006), "The quality of online and offline relationships: the role of multiplexity and duration of social relationships", *The Information Society*, Vol. 22 No. 3, pp. 137-48.

Milgram, S. (1967), "The small world problem", *Psychology Today*, Vol. 2, pp. 60-7.

Nie, N.H. and Erbing, L. (2000), "Internet and society: a preliminary report", paper presented at the Stanford Institute for the Quantitative Study of Society, Stanford, CA.

Owyang, J. (2008), *Teleconference Strategy for Facebook: A Ready-Made Marketing Platform*, Forester Research.

Papacharissi, Z. and Rubin, A. (2000), "Predictors of internet use", *Journal of Broadcasting and Electronic Media*, Vol. 44 No. 2, pp. 175-96.

Parks, M.R. and Floyd, K. (1996), "Making friends in cyberspace", *Journal of Communication*, Vol. 46 No. 1, pp. 80-97.

Paul, E. and Brier, S. (2001), "Friendsickness in the transition to college: precollege predictors and college adjustment correlates", *Journal of Counseling and Development*, Vol. 79 No. 1, pp. 77-89.

Pereira, C.S. and Soares, A.L. (2007), "Improving the quality of collaboration requirements for information management through social networks analysis", *International Journal of Information Management*, Vol. 27 No. 2, pp. 86-103.

Pierce, T.A. (2007), "X-posed on myspace: a content analysis of MySpace social networking sites", *Journal of Media Psychology*, Vol. 12 No. 1.

Pool, L. and Kochen, M. (1978), "Contacts and influence", *Social Networks*, Vol. 1, pp. 1-48.

Putnam, R.D. (2000), *Bowling Alone: The Collapse and Revival of American Community*, Simon & Schuster, New York, NY.

Segars, A.H. (1996), "Assessing the unidimensionality of measurement: a paradigm and illustration within the context of information system research", *Omega*, Vol. 25 No. 1, pp. 107-21.

Sproull, L. and Faraj, S. (1995), *Public Access to the Internet*, MIT Press, Cambridge, MA.

Sundén, J. (2003), "Material virtualities", paper presented at the New York: Peter Lang.

Thoits, P. (1982), "Conceptual, methodological and theoretical problems in studying social support as a buffer against life stress", *Journal of Health and Social Behavior*, Vol. 23, pp. 145-59.

Van der Poel, M. (1993), "Delineating personal support networks", *Social Networks*, Vol. 15, pp. 49-70.

Wellman, B. (1979), "The community question: the intimate networks of East Yorkers", *American Journal of Sociology*, Vol. 84, pp. 1201-31.

Wellman, B. (1996), "Computer networks as social networks: collaborative work, telework and virtual commnuity", *Annual Review of Sociology*, Vol. 22, pp. 211-38.

Wellman, B., Haase, A.Q., Witte, J. and Hampton, K. (2001), "Does the internet increase, decrease, or supplement social capital? Social networks, participation, and community commitment", *American Behavioral Scientist*, Vol. 45 No. 3, pp. 436-55.

Wikipedia (2010), available at: http://zh.wikipedia.org/zh-tw/Facebook

Wills, T. (1985), "Supportive functions of interpersonal relationships", in Cohen, S. and Syme, S.L. (Eds), *Social Support and Health*, Academic Press, Orlando, FL.

Yang, S.C. and Farn, C.K. (2009), "Social capital, behavioural control, and tacit knowledge sharing: a multi-informant design", *International Journal of Information Management*, Vol. 29 No. 3, pp. 210-18.

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